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RAILWAY AND PIPELINE TRANSPORTATION OF COAL
INFORMATION FROM A RECENT SERIES OF VISITS

by

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INTRODUCTION

A series of visits were undertaken between August 27 and 30, 1962 in Washington, D. C. and Virginia to obtain information useful to the studies on transportation undertaken by the Fuels and Mining Practice Division in accordance with Resolution 4, Ottawa Meeting, September 21, 1961, for the Western Region (Coal) Study Group. Mr. W. C. Whittaker, Member, Dominion Coal Board and Managing Director, The Coal Operator's Association of Western Canada accompanied Dr. J. H. Walsh for most of these discussions. The organizations visited were as follows:

The National Coal Association, Washington, D. C., August 27 and 29,
The Norfolk and Western Railway, Norfolk and Roanoke, Virginia, August 27 and 28,
The Southern Railway Car Exhibit, August 29,
Mr. Norman Chappel, Counsellor (Energy), The Canadian Embassy, Washington, D. C., August 29,
The United States Bureau of Mines, Washington, D. C., August 30.

An important objective of this series of visits was to obtain first-hand information concerning the relative competitive position of modern railway transportation methods as compared to the coal slurry pipeline technique for the transportation of coal.

The information obtained indicates that little difference exists between possible costs by these two transportation methods.

NEW RAILWAY TRANSPORTATION METHODS

In the following discussion the nomenclature adopted by the United States Bureau of Mines will be used. The term "shuttle train" will refer to the presently operating trains consisting of standard cars operated as a unit and powered in the conventional way. The cars are kept coupled together during shipment and only separated when necessary for loading, unloading, and repairs. There is thus no new technology needed for the operation of "shuttle trains", although improved methods of locating sources of trouble such as hot box detectors that operate without requiring the train to stop have helped to bring this type of fast moving, through heavy train to a practical reality. Shuttle trains are now operating mainly in the eastern section of the United States and are usually moving coal traffic. Where circumstances permit as many as 250 hopper cars are operated as single trains carrying loads up to 20,000 net tons of coal. Most shuttle trains will be limited, however, to 190 cars and loads of about 15,000 net tons. (For comparison, lake freighters, usually considered a very economic form of transport, carry in the larger vessels 20,000 to 25,000 net tons.)

With the introduction of "shuttle trains" special rates have been quoted by the railway companies at levels significantly below those applicable to single car shipments. These bulk rates decrease as the minimum guaranteed volume of shipment increases. Other requirements for these lower rates to apply include loading and unloading of the train within a short specified time. Provision has been made in most agreements to enable the train to be assembled from several near-by sources, and deliver the coal to several destinations located in close proximity to one another - although at the moment it appears that all the "shuttle" train shipments are being made to single destinations.

The "integral" train or the "Unitrain" is an extension of the shuttle train concept to effect further economies. This type of train would be specially designed for this service and may be capable of carrying heavier loads (up to 25,000 net tons). Specially designed loading and unloading devices will be used. The power units may be distributed along the train to obtain more efficient traction, and the train would carry enough fuel to last the entire trip. A high degree of mechanical reliability would be built into the train. Preliminary design work is now being carried out by several United States railway companies and by the New York consulting firm of Theodore Kauffield.

The savings to the railway company over the conventional methods of train handling accrue from the elimination of time-consuming yard operations, (involving the holding and classification of individual cars), more effective use of equipment (as the time of shipment is reduced materially), and overhead savings (as weighing and other documentation of separate cars is no longer necessary). Hopper cars which hold from 60-110 tons and cost about \$12,000 are not used as a storage facility often made available by the railway company at nominal cost.

Nonetheless some storage capacity is nearly always required at the shipping or receiving end or both. If this service is withdrawn with the introduction of shuttle trains, then additional costs will be incurred that must be balanced against the savings in the freight rate quoted. It is difficult to see how major savings in train operating cost could be made with these new methods as compared to present large scale coal movements from point-to-point locations. The savings are, as noted, largely not connected with the actual operation of the train but from the elimination of costly yard and documentation operations, and more effective use of equipment. It is evident that this new development in railway practice is just at its initial stage of implementation, and that rapid changes of both a technical and of a commercial nature are to be expected.

COAL PIPELINES

Opportunity was taken of the visit to the United States Bureau of Mines to interview Mr. T.R. Scollan, Chief, and Mr. Harry Perry of the Bituminous Coal Section who were largely responsible for a publication of the Department of the Interior report entitled "Report to the Panel on Civilian Technology on Coal Slurry Pipelines" dated May 1, 1962. This report compares coal slurry pipelines with railway and other methods of coal and energy transportation, and it is the most complete document yet prepared on this subject. The study is particularly concerned with the hypothetical movement of coal from West Virginia to the Baltimore - New York region for power generation purposes. The alternative methods, including high voltage transmission lines are also assessed, and the conclusions of this report will be discussed in a later section below.

This hypothetical study is quite obviously related to the current proposal to build almost precisely such a coal slurry pipeline. Despite Administration backing, the enabling legislation that would permit this pipeline company to expropriate the necessary land was not obtained from the last session of the Congress. Such federal legislation is essential, for, as the report points out, only West Virginia has granted this right to coal slurry pipelines; the other states involved would all have to pass similar legislation. In view of the opposition of the railway companies it is far from certain that this legislation will be enacted at the state (and perhaps even at the federal) level - in fact, one state (New Jersey) whose legislation covering oil and gas pipelines might have been interpreted as covering the construction of any pipeline has passed legislation in its Senate to specifically withdraw this right for coal slurry pipelines. This state of affairs should serve as a commentary for those who still believe in the political power of the coal industry. It seems certain that without action of the Congress no interstate coal slurry pipeline could be built. This situation is in contrast to the privileges enjoyed by the oil and gas pipelines. The legal position of coal slurry pipelines that would prevail in Canada is not known to the author.

Another major imponderable is the question of long term contracts. It would seem to be very unlikely that a coal slurry pipeline could be financed without a guarantee of this sort except in a very special situation. As pipelines are usually depreciated over a long period - the presently operating Cadiz-Cleveland line is expected to last longer than the fifteen years originally assumed - the question of the advent of nuclear power arises. This uncertainty would appear to the author to favour the choice of improved railway technology as the more likely transportation method, since the new capital outlay involved varies from essentially nothing for "shuttle" trains to a relatively small value for special "integral" trains. As the trains involve a considerable quantity of what might be termed mechanical equipment subject to wear, a depreciation policy of ten years may be considered. There may be much less opposition to long term contracts for this shorter period.

As other reports in this series have dealt with the technology of solids pipelines in detail the only comments that will be made here will concern the attitude of the experts of the United States Bureau to the status of present technology. It is their view that a pipeline of the type now operating in Ohio can now be built with a high degree of confidence in its performance, both from the technical and economic standpoints. There is little reason to doubt competent engineering proposals for pipelines operating in this flow regime. There are, however, uncertainties relating to the extension of pipeline slurry methods to higher coal concentrations and to larger particle sizes, as well as to other

denser and more abrasive solids. For this reason the Bureau is conducting experimental investigations first in its laboratories at Schuylkill Haven, Pa., primarily for lifting studies, and later at Bruceton, Pa., in a one mile loop. There is every reason to believe, also, that the authors of this report enjoyed the confidence of the Consolidation Coal Company (the principals of the Ohio pipeline), and, while no proprietary knowledge was disclosed, the report very likely reflects the engineering judgement of that company based on their operating experience to date.

The report touched on the possibility of pipelining coal in oil slurries. While this practice was recognized as being technically feasible, it was pointed out that there were few opportunities to use this technique in the United States as rarely were oil and coal movements parallel to each other in that country.

As far as other transportation methods for solids were concerned, long distance conveyor belts were found to be too capital intensive, and pneumatic pipeline methods either not perfected or were found to have an excessive energy consumption. It is interesting to note that the transportation experts of the Bureau of Mines, and for that matter the other organizations visited, were not familiar with the French development known as the "Flying Feeder" even though there are several references to this development in the French literature and at least one in the English. Interest in this new method was expressed, and U.S. Bureau of Mines personnel may visit this development in France. It is unfortunate that the unsettled Algerian situation has postponed what was to have been the first commercially sized (three million tons per year) application of this rather unique and interesting transportation method. More details are given in a forthcoming report in this series.

The report also indicated that for the case where the coal is used only for electrical energy generation, high voltage transmission directly from the coal fields to the large energy consumption centers either by A.C. or D.C. is a closely competitive method. It is difficult to assess this alternative because the installation of long distance transmission lines allow the "firming" up of energy produced at other stations simply because of interconnection, and because of other advantages, such as the construction of generating stations in remote areas where pollution and water problems may be less severe.

LAMBERT'S POINT SHIP LOADING FACILITIES

The visit to the Norfolk and Western Railway at Norfolk, Virginia, allowed an excellent opportunity to inspect the coal loading facilities at Lambert's Point. Other railway companies maintain loading facilities in the same general area (Hampton Roads shipping area) notably the Chesapeake and Ohio Railway. The present loading facilities at Lambert's Point are recognized as being outdated and a new loading pier is under construction. The presently operating pier date from about 1914 and the early nineteen twenties. As a general rule no storage is provided for coal to be shipped — the entire shipment remains on rail cars until the vessel is ready for loading. Owing to the track arrangement the railway company can withdraw cars from a large number of tracks to meet blend specifications. The cars are withdrawn from trains on the various tracks in an order prescribed by the shipper. The coal is then weighed and loaded. Loading charges were said to vary from 4 1/2 to a little over twenty cents per ton of coal depending upon the size of shipment and the degree of service required. In view of the storage provided in the rail cars, and the service provided in allowing blending from a large number of sources, the loading charges appear very reasonable.

The new pier now nearing completion will allow loading at the rate of 10,000 tons per hour. The coal will move from conventional car dumpers to the loading boom by means of an eight foot wide conveyor. This new pier will significantly improve the loading facilities available to American coal exporters.

It is noteworthy that a lower "competitive" rail rate is applicable on coal shipped from the mines to Norfolk whose final destination is New England, as compared to the rate applicable for export shipment. This lower rate was established to make coal competitive with residual oil at New England points. Presumably the lower rate could be made applicable to all shipments should competitive conditions arise in the export market.

SUMMARY

This short series of visits served to confirm what has been steadily becoming more certain during the last few years - that there is no engineering reason why the cost of moving solids under certain favourable circumstances cannot be substantially reduced either by railway or pipeline methods. It is also apparent that, more than any other single cause, the advent of the solid-slurry pipeline is causing a change in the standard railway operations. For several large railway companies, the coal hauling business represents a large proportion of their revenue, in some cases as high as 80%, and these companies have no intention of losing this business if it can at all be helped. In the past, users of large quantities of coal were in fact subsidizing coal movements to small users; now the railway company must offer competitive (and much lower) rates to other bulk shipment methods which will mean in turn a change in the situation confronting the small coal user. Whether integral trains or pipelines or perhaps even some other form of solids transport, becomes dominant it seems likely that the single car rates to small users will in the long run have to rise. Thus the competitive pressure of the slurry pipeline will cause a major re-adjustment in the historic rail rate structure. Very low rates by present standards will apply to large users, and, very likely higher rate to small users. The implications and consequences of a change of this character are so large, particularly for a transportation dependent country such as Canada, that it is difficult to draw any general conclusion. It is recommended, therefore, that this subject be kept under close review at this time at the start of this major period of change.

JHW/ph